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EXAMINER	
RAO, ANAND SHASHIKANT	
ART UNIT	**PAPER NUMBER**
2613	

DATE MAILED: 09/15/2004 4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/924,079	XIANG ET AL.
	Examiner	**Art Unit**
	Andy S. Rao	2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-47 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-47 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 3.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 32-40, and 47 are rejected under 35 U.S.C. 102(e) as being anticipated by Wilson.

Wilson discloses a video compression system, comprising: a processor-based platform coupled to a bus subsystem (Wilson: column 7, lines 1-20); and coupled to bus subsystem, a front end subsystem having at least a motion estimation and compensation (MEC) engine (Wilson: column 21, lines 40-51) coupled to a stream buffer (Wilson: column 9, lines 40-54), as in claim 32.

Regarding claims 33-36, Wilson discloses an AxB array formed from a plurality of cells coupled to a set of controllers and an end column processor (Wilson: column 11, liens 5-67), as in the claims.

Regarding claim 37, Wilson discloses controllers having respective control lines coupled to the MEC array to form a MIMD arrangement (Wilson: column 2, lines 1-33), as in the claim.

Regarding claim 38, Wilson discloses an end column processor receives output signals from the MEC array (Wilson: column 9, liens 55-65), as in the claim.

Regarding claim 39, Wilson discloses that the system in included in a multimedia device (Wilson: column 10, lines 50-55), as in the claim.

Regarding claim 40, Wilson discloses that the system is including as an ASIC application (Wilson: column 7, lines 40-45; column 1, lines 40-45), as in the claim.

Wilson discloses video processing system (Wilson: column 7, lines33-45) capable of providing motion compensation (Wilson: column 21, lines 40-45), comprising: array means for processing data received from memory means to determine a motion vector (Wilson: column 7, lines 10-15); coupled to the array means, means for selectively controlling the array means to enable processing of the data received (Wilson: column 9, lines 40-67); and coupled to the array means, end column means for obtaining the motion vector from the array means (Wilson:

column 11, lines 5-23) to enable motion compensation (Wilson: column 21, lines 40-45), as in claim 47.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-29 and 41-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson in view of Masuda et al., (hereinafter referred to as "Masuda").

Wilson discloses a method of motion estimation and compensation processing (Wilson: column 21, lines 40-45), comprising: determining a preliminary motion vector from a set of partial motion vectors each associated with a corresponding subsampled matchblock representing a given picture (Wilson: column 21, lines 47-49); generating a second motion vector based on a refined granularity of the preliminary motion vector (Wilson: column 21, lines 50-52), as in claim 1. However, even though Wilson discloses refining a motion vector search, it fails to discloses performing a fractional pixel search using the second motion vector to produce a final motion vector, the final motion vector being used for motion compensation, as in the claim. Masuda discloses the use of a two stage motion vector detection method (Masuda: column 12, lines 35-68; column 13, lines 1-10) wherein a final motion vector is generated using a fractional pixel search in order to predict an optimum prediction signal can be obtained for a partial area whose movement is small (Masuda: column 14, lines 25-43). Accordingly, given this teaching, it

would have been obvious for one of ordinary skill in the art to incorporate the Masuda teaching of a two stage fractional pixel precision motion vector detection into the Wilson method in order generate an optimum prediction signal for a partial area whose movement is small. The Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has all of the features of claim 1.

Regarding claim 2, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has dividing the matchblock associated with the given picture into a plurality of first sub-blocks (Masuda: column 12, lines 47-51); dividing a search area associated with a reference picture into a plurality of second sub-blocks (Masuda: column 14, lines 1-9), the second sub-blocks being divided by a factor similar to that used to divide the first sub-blocks (Masuda: column 18, lines 4-23); duplicating one of the first sub-blocks over each of the second sub-blocks (Masuda: column 18, lines 30-45); and determining a set of best matches between a respective sub-image in each of the first sub-blocks and a sub-image in each corresponding one of the second sub-blocks, the set of best matches representing the set of partial motion vectors (Masuda: column 18, lines 50-65), as in the claim.

Regarding claims 3-6, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has the first sub-blocks each comprises a Q x Q array of pixels subsampled from the matchblock, and the second sub-blocks each comprises an M x M array of pixels (Wilson: column 21, lines 40-55), as in the claims.

Regarding claim 7, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has wherein determining a set of best matches comprises: performing exhaustive searches in parallel for each of the first sub-blocks over each

respect one of the second sub-blocks (Wilson: column 16, lines 65-67; column 17, lines 1-30), as in the claim.

Regarding claims 8-9, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has calculating a partial sum of absolute distance (Psad) between coordinate positions of one first sub-block and a corresponding one of the second sub-blocks (Wilson: column 21, lines 40-45), as in the claims.

Regarding claim 10, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has wherein performing exhaustive searches in parallel comprises: contemporaneously moving each of the second sub-blocks relative to each corresponding first sub-block to a next location (Masuda: column 14, lines 1-43); and calculating a partial sum of absolute distance (Psad) between coordinate positions of one first sub-block and a corresponding one of the second sub-blocks (Wilson: column 21, lines 40-45), as in the claim.

Regarding claim 11, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has generating a second motion vector based on a refined granularity of the preliminary motion vector, comprises: obtaining the matchblock associated with the given picture; enlarging a first search area to generate a second search area, the first search area being associated with a reference picture and used to determine the set of partial motion vectors (Masuda: column 14, lines 8-30); and determining a best match between a respective sub-image located in the matchblock and a sub-image that is identical to the respective sub- image and that is located in the second search area (Masuda: column 14, lines 35-45), the best match representing the second motion vector (Masuda: column 14, lines 65-67; column 15, lines 1-10), as in the claim.

Regarding claims 12-15, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has wherein determining a best match comprises: performing an exhaustive search for the respective sub-image over the second search area (Masuda: column 15, lines 1-12).

Regarding claims 16-17, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has. the matchblock comprises an M x M array of pixels, the first search area comprises a Q x Q array of pixels as specified (Wilson: column 21, lines 40-55), as in the claims.

Regarding claims 18-23, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has performing a fractional pixel search using the second motion vector to produce a final motion vector, comprises: obtaining the matchblock associated with the given picture (Masuda: column 18, lines 1-10); enlarging a first search area to generate a second search area, the first search area being associated with a reference picture and used to determine the second motion vector (Masuda: column 14, liens 5-20); determining a half-pixel predicted reference macroblock associated with the second search area (Masuda: column 14, lines 33-37); and determining a best match between a respective sub-image located in the matchblock and a sub-image that is identical to the respective sub- image and that is located in the second search area (Masuda: column 12, lines 55-65), the best match representing the second motion vector (Masuda: column 15, lines 1-10), as in the claims.

Regarding claims 24-29, the Wilson method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has determining residual data associated with the final motion vector (Masuda: column 13, lines 1-35); and reconstructing a video signal for

encoding based on the residual data and the final motion vector (Masuda: column 14, lines 25-68), as in the claims.

Wilson discloses a computer-implemented method (Wilson: column 7, lines 32-45) of motion estimation processing (Wilson: column 21, lines 40-45), comprising: dividing a matchblock of a current frame into a plurality of sub-matchblocks (Wilson: column 21, lines 53-55), the current frame to be encoded (Wilson: column 7, lines 43-45); dividing a first search area of a reference frame into a plurality of search sub-blocks (Wilson: column 21, lines 40-41); replicating a sub-matchblock over each of the search sub-blocks (Wilson: column 21, lines 43-45); performing partial pixel level searching in parallel (Wilson: column 23, lines 25-31) of each sub-matchblock replicated over the search sub-blocks to generate a preliminary motion vector (Wilson: column 21, lines 49-51); modifying the first search area to produce a second search area (Wilson: column 21, lines 49-51); performing full pixel level searching of the matchblock over the second search area to generate a second motion vector (Wilson: column 21, lines 49-51), as in claim 30. However, even though Wilson discloses refining a motion vector search, it fails to discloses performing a fractional pixel search using the second motion vector to produce a final motion vector, the final motion vector being used for motion compensation, as in the claim. Masuda discloses the use of a two stage motion vector detection method (Masuda: column 12, lines 35-68; column 13, lines 1-10) wherein a final motion vector is generated using a fractional pixel search in order to predict an optimum prediction signal can be obtained for a partial area whose movement is small (Masuda: column 14, lines 25-43). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the Masuda teaching of a two stage fractional pixel precision motion vector detection into the Wilson computer

implemented method in order generate an optimum prediction signal for a partial area whose movement is small. The Wilson computer implemented method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has all of the features of claim 30.

Regarding claim 31, the Wilson computer implemented method, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has determining residual data associated with the final motion vector (Masuda: column 13, lines 1-35); and reconstructing a video signal for encoding based on the residual data and the final motion vector (Masuda: column 14, lines 25-68), as in the claims.

Wilson discloses a computer program product (Wilson: column 7, lines 35-41) for motion estimation and compensation (Wilson: column 21, lines 40-45), the computer program product stored on a computer readable medium and adapted to perform operations (Wilson: column 50-55) of: determining a preliminary motion vector from a set of partial motion vectors each associated with a corresponding subsampled matchblock representing a given picture (Wilson: column 21, lines 47-49); generating a second motion vector based on a refined granularity of the preliminary motion vector (Wilson: column 21, lines 50-52), as in claim 41. However, even though the Wilson computer program product as stored on a computer readable medium discloses refining a motion vector search, it fails to discloses performing a fractional pixel search using the second motion vector to produce a final motion vector, the final motion vector being used for motion compensation, as in the claim. Masuda discloses the use of a two stage motion vector detection method (Masuda: column 12, lines 35-68; column 13, lines 1-10) wherein a final motion vector is generated using a fractional pixel search in order to predict an optimum prediction signal can be obtained for a partial area whose movement is small (Masuda: column

14, lines 25-43). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the Masuda teaching of a two stage fractional pixel precision motion vector detection into the Wilson computer program product as stored on a computer readable medium in order generate an optimum prediction signal for a partial area whose movement is small. The Wilson computer program product as stored on a computer readable medium, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has all of the features of claim 41.

Wilson discloses a computer program product (Wilson: column 7, lines 35-41) for video compression processing (Wilson: column 7, lines 43-45), the computer program product stored on a computer readable medium (Wilson: column 10, lines 50-55), and adapted to perform operations of dividing a matchblock of a current frame into a plurality of sub-matchblocks (Wilson: column 21, lines 51-55), the current frame to be encoded (Wilson: column 7, lines 43-45); dividing a first search area of a reference frame into a plurality of search sub-blocks (Wilson: column 21, lines 40-41); replicating a sub-matchblock over each of the search sub-blocks (Wilson: column 21, lines 43-45); performing partial pixel level searching in parallel (Wilson: column 23, lines 25-31) of the sub-matchblocks replicated over the search sub-blocks to generate a preliminary motion vector (Wilson: column 21, lines 49-51); modifying the first search area to produce a second search area (Wilson: column 21, lines 49-51); performing full pixel level searching of the matchblock over the second search area to generate a second motion vector (Wilson: column 21, lines 49-51), as in claim 42. However, even though Wilson discloses refining a motion vector search, it fails to discloses performing a fractional pixel search using the second motion vector to produce a final motion vector, the final motion vector being used for

motion compensation, as in the claim. Masuda discloses the use of a two stage motion vector detection method (Masuda: column 12, lines 35-68; column 13, lines 1-10) wherein a final motion vector is generated using a fractional pixel search in order to predict an optimum prediction signal can be obtained for a partial area whose movement is small (Masuda: column 14, lines 25-43). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the Masuda teaching of a two stage fractional pixel precision motion vector detection into the Wilson computer program product as stored on a computer readable medium in order generate an optimum prediction signal for a partial area whose movement is small. The Wilson computer program product as stored on a computer readable medium, now incorporating Masuda's two stage fractional pixel precision motion vector detection, has all of the features of claim 42.

Wilson discloses a video processing system (Wilson: column 7, lines 35-45) providing motion compensation (Wilson: column 21, lines 40-45), comprising: means for determining a preliminary motion vector from a set of partial motion vectors each associated with a corresponding subsampled matchblock representing a given picture (Wilson: column 21, lines 47-49); coupled to the means for determining, means for generating a second motion vector based on a refined granularity of the preliminary motion vector (Wilson: column 21, liens 50-52); determining a preliminary motion vector from a set of partial motion vectors each associated with a corresponding subsampled matchblock representing a given picture (Wilson: column 21, lines 47-49); generating a second motion vector based on a refined granularity of the preliminary motion vector (Wilson: column 21, lines 50-52), as in claim 43. However, even though Wilson discloses refining a motion vector search, it fails to discloses means for performing a fractional

pixel search using the second motion vector to produce a final motion vector, the final motion vector being used for motion compensation, as in the claim. Masuda discloses the use of a two stage motion vector detection method (Masuda: column 12, lines 35-68; column 13, lines 1-10) wherein a final motion vector is generated using a fractional pixel search in order to predict an optimum prediction signal can be obtained for a partial area whose movement is small (Masuda: column 14, lines 25-43). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the Masuda teaching of a two stage fractional pixel precision motion vector detection into the Wilson video processing system as stored on a in order generate an optimum prediction signal for a partial area whose movement is small. The Wilson video processing system, now incorporating Masuda's means for implementing two stage fractional pixel precision motion vector detection, has all of the features of claim 43.

Regarding claim 44, the Wilson video processing system, now incorporating Masuda's means for implementing two stage fractional pixel precision motion vector detection, has means for dividing the matchblock associated with the given picture into a plurality of first sub-blocks (Masuda: column 12, liens 47-51); means for dividing a search area associated with a reference picture into a plurality of second sub-blocks (Masuda: column 14, liens 1-9), the second sub-blocks being divided by a factor similar to that used to divide the first sub- blocks (Masuda: column 18, lines 4-23); means for duplicating one of the first sub-blocks over each of the second sub-blocks (Masuda: column 18, lines 30-45); and means for determining a set of best matches between a respective sub- image in each of the first sub-blocks and a sub-image in each corresponding one of the second sub-blocks, the set of best matches representing the set of partial motion vectors (Masuda: column 18, lines 50-65), as in the claim.

Regarding claims 45-46, the Wilson video processing system, now incorporating Masuda's means for implementing two stage fractional pixel precision motion vector detection, has means for obtaining the matchblock associated with the given picture ; means for enlarging a first search area to generate a second search area, the first search area being associated with a reference picture and used to determine the set of partial motion vectors (Masuda: column 14, lines 8-30); and means for determining a best match between a respective sub-image located in the matchblock and a sub-image that is identical to the respective sub-image and that is located in the second search area (Masuda: column 14, lines 35-45), the best match representing the second motion vector (Masuda: column 14, lines 65-67; column 15, lines 1-10), as in the claims.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ishihara discloses a motion vector detecting device.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy S. Rao whose telephone number is (703)-305-4813. The examiner can normally be reached on Monday-Friday 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris S. Kelley can be reached on (703)-305-4856. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andy S. Rao
Primary Examiner
Art Unit 2613

ANDY RAO
PRIMARY EXAMINER

asr
September 8, 2004